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| EXAMINER | |
|---|---|
| KRAIG, WILLIAM F | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2815 | |

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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/799,961 | HOFFMAN ET AL. | |
| | Examiner | Art Unit | |
| | William Kraig | 2815 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *14 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-57* is/are pending in the application.

4a) Of the above claim(s) *21-36 and 45-47* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20,37-44 and 48-57* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Specification*

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Transistor with Metal Oxide Channel".

### *Claim Rejections - 35 USC § 112*

2. The Examiner's rejections of claims 1, 4, 5, 8, 9, 12, 13, 16 and 17 under 35 U.S.C. 112, 2nd paragraph, are withdrawn in light of the Applicant's amendments to the claims dated 3/10/2006.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 4, 6, 8, 10, 12, 14, 16, 18, 20, 48, 49, 51, 53 and 55 rejected under 35 U.S.C. 102(b) as being anticipated by Cillessen et al. (U.S. Patent # 5744864).

Regarding claim 1, Fig. 4 of Cillessen et al. discloses a semiconductor device, comprising:

a drain electrode (2);

a source electrode (3);

a channel (4) contacting the drain electrode (2) and the source electrode (3), wherein the channel includes one or more compounds of the formula $A_xB_xO_x$, wherein each A is selected from the group of Ga, In, each B is selected from the group of Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and each of A and B being different (Cillessen et al., Col. 2, Lines 13-21) (Cillessen describes the use of compounds of oxides including Ga, In, Ge, Sn and Pb, for the semiconductor material in a switching element); and

a gate dielectric (6) positioned between a gate electrode (5) and the channel (4).

Regarding claim 4, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-tin oxide, indium-lead oxide (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 6, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes $C_x$, to form a compound of the formula $A_xB_xC_xO_x$, wherein each C is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, and C are different (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 8, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium-tin oxide, gallium-tin-lead oxide, gallium-germanium-lead oxide, gallium-indium-germanium oxide, gallium-indium-tin oxide, gallium-indium-lead oxide, indium-germanium-tin oxide, indium-tin-lead oxide, indium-germanium-lead oxide (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 10, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 6, wherein the one or more compounds of formula $A_xB_xC_xO_x$, includes $D_x$, to form a compound of the formula $A_xB_xC_xD_xO_x$, wherein each D is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, C, and D are different (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 12, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium-tin-lead oxide, gallium-indium-germanium-tin oxide, gallium-indium- germanium-lead oxide, gallium-indium-tin-lead oxide, indium-germanium-tin-lead oxide (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 14, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 10, wherein the one or more compounds of formula $A_xB_xC_xD_xO_x$ includes $E_x$, to form a compound of the formula $A_xB_xC_xD_xE_xO_x$, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, C, D, and E are different (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 16, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-indium-germanium-tin-lead oxide (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 18, Fig. 4 of Cillessen et al. discloses a semiconductor device, comprising:

a drain electrode (2);

a source electrode (3);

means for controlling current flow (4) to electrically coupled to the drain electrode (2) and the source electrode (3), wherein the means for controlling current flow (4) includes one or more compounds of the formula $A_xB_xO_x$, wherein each A is selected from the group of Ga, In, each B is selected from the group of Ge, Sn, Pb, each O is atomic oxygen, and each of A and B being different (Cillessen et al., Col. 2, Lines 13-21) (Cillessen describes the use of compounds

of oxides including Ga, In, Ge, Sn and Pb, for the semiconductor material in a switching element); and

a gate electrode (5) separated from the channel (4) by a gate dielectric (6).

Regarding claim 20, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 18, wherein the source (3), drain (2), and gate (5) electrodes include a substantially transparent material (Cillessen et al., Col. 4, Lines 25-36).

Regarding claim 48, Figs. 4 and 8 of Cillessen et al. discloses a display device, comprising:

a plurality of pixel devices (Cillessen et al., Col. 7, Lines 46-48) configured to operate collectively to display images (Cillessen et al., Col. 7, Lines 46-48), where each of the pixel devices includes a semiconductor device (1) configured to control light emitted by the pixel device (Cillessen et al., Col. 7, Lines 41-48), the semiconductor device including:

a drain electrode (2);

a source electrode (3);

a channel (4) contacting the drain (2) electrode and the source (3) electrode, wherein the channel (4) includes one or more compounds of the formula $A_xB_xO_x$, wherein each A is selected from the group of Ga, In, each B is selected from the group of Ge, Sn, Pb, each O is atomic oxygen, each x is

independently a non-zero number, and wherein each of A and B are different (Cillessen et al., Col. 2, Lines 13-21); and

a gate electrode (5); and

a gate dielectric (6) positioned between the gate electrode (5) and the channel (4) and configured to permit application of an electric field to the channel (Cillessen et al., Col. 7, Lines 51-53).

Regarding claim 49, Fig. 4 of Cillessen et al. discloses the display of claim 48, wherein the source (3), the drain (2), and the gate (5) electrodes include a substantially transparent material (Cillessen et al., Col. 4, Lines 25-36).

Regarding claim 51, Fig. 4 of Cillessen et al. discloses the display of claim 48, wherein the one or more compounds of the formula $A_xB_xO_x$ includes $C_x$, to form a compound of the formula $A_xB_xC_xD_xE_xO_x$, wherein each C is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A., B, and C are different (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 53, Fig. 4 of Cillessen et al. discloses the display of claim 51, wherein the one or more compounds of formula $A_xB_xC_xO_x$, includes $D_x$, to form a compound of the formula $A_xB_xC_xD_xO_x$, wherein each D is selected from the group of Ga,

In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, C, and D are different (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 55, Fig. 4 of Cillessen et al. discloses the display of claim 53, wherein the one or more compounds of formula $A_xB_xC_xD_xO_x$ includes $E_x$, to form a compound of the formula $A_xB_xC_xD_xE_xO_x$, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, each x is independently a non-zero number, and wherein each of A, B, C, D, and E are different (Cillessen et al., Col. 2, Lines 13-21).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2, 3, 5, 7, 9, 11, 13, 15, 17, 19, 37-44, 50, 52, 54, 56 and 57 rejected under 35 U.S.C. 103(a) as being unpatentable over Cillessen et al. (U.S. Patent # 5744864).

Regarding claim 2, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, but fails to disclose the one or more compounds of the formula $A_xB_xO_x$ including a ratio of A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xO_x$ include a ratio of A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 3, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, but fails to specifically disclose that the metal oxide is formed in one of an amorphous form, a single-phase crystalline form, and a mixed-phase crystalline form. Cillessen does teach that the metal oxide is formed using the process of Pulsed Laser Deposition. Fig. 1 of Sakashita et al. (U.S. Patent Publication # 2004/0245561) discloses the formation (using Pulsed Laser Deposition (Paragraph 48, Lines 12-18)) of a thin film of Indium Tin Oxide 6 in an amorphous form (Paragraph 49, Lines 1-3).

Regarding claim 5, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 4, but fails to disclose the one or more compounds of the formula $A_xB_xO_x$ including an atomic composition of ratio A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xO_x$ include a ratio of A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 7, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 6, but fails to disclose the one or more compounds of the formula $A_xB_xC_xO_x$ including an atomic composition of ratio A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xO_x$ include a ratio of A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 9, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 8, but fails to disclose the one or more compounds of the formula $A_xB_xC_xO_x$ including an atomic composition of ratio A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xO_x$ include a ratio of A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 11, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 10, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xO_x$ including an atomic composition of ratio A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xO_x$ include a ratio of A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus

modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C to D in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 13, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 12, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xO_x$ including an atomic composition of ratio A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xO_x$ include a ratio of A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C to D in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 15, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 14, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ including an atomic composition of ratio A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ include a ratio of A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C to D to E in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 17, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 16, but fails to disclose the gallium-indium-germanium-tin-lead oxide including an atomic composition of ratio A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the gallium-indium-germanium-tin-lead oxide include a ratio of A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C to D to E in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 19, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 18, but fails to specifically disclose that the metal oxide is formed in one of an amorphous form, a single-phase crystalline form, and a mixed-phase crystalline form. Cillessen does teach that the metal oxide is formed using the process of Pulsed Laser Deposition. Fig. 1 of Sakashita et al. (U.S. Patent Publication # 2004/0245561) discloses the formation (using Pulsed Laser Deposition (Paragraph 48, Lines 12-18)) of a thin film of Indium Tin Oxide 6 in an amorphous form (Paragraph 49, Lines 1-3).

Regarding claim 37, Fig. 4 of Cillessen et al. discloses a semiconductor device formed by the steps, comprising:

providing a drain electrode (2);

providing a source electrode (3);

depositing a channel (4) including a composition (composition including one or more precursor compounds that include $A_x$ and one or more compounds that include $B_x$, wherein each A is selected from the group of Ga, In, each B is selected from the group Ge, Sn, Pb) to form a multicomponent oxide, each x is independently a non-zero number, and wherein each of A and B are different (Cillessen et al., Col. 2, Lines 13-21) from the composition to electrically couple the drain electrode (2) and the source electrode (3);

providing a gate electrode (5); and

providing a gate dielectric (6) positioned between the gate electrode (5) and the channel (4).

Cillessen et al., however, fails to disclose the step of providing a precursor composition.

The claim to providing a precursor composition is a product by process limitation and is given no patentable weight so long as the final product of said claim is the same as or obvious over the prior art. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The particular process of providing a precursor composition is therefore irrelevant given that the final product of the claim is anticipated by Cillessen et al.

Regarding claim 38, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 37, wherein the one or more precursor compounds includes one or more precursor components that include $C_x$, wherein each C is selected from the group of Ga, In, Ge, Sn, Pb, each x is independently a non-zero number, and wherein each of A, B, and C are different (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 39, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 38, wherein the one or more precursor compounds includes one or more precursor compounds that include $D_x$, wherein each D is selected from the group of Ga, In, Ge, Sn, Pb, each x is independently a non-zero number, and wherein each of A, B, C, and D are different (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 40, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 39, wherein the one or more precursor compounds includes one or more precursor compounds that include $E_x$, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb, each x is independently a non-zero number, and wherein each of A, B, C, D, and E are different (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 41, Cillessen et al. discloses the semiconductor device of claim 40, but fails to disclose a method wherein depositing the channel includes vaporizing the precursor composition to form a vaporized precursor composition, and depositing the vaporized precursor composition using a physical vapor deposition technique including one or more of dc reactive sputtering, rf sputtering, magnetron sputtering, ion beam sputtering.

These claims to a method wherein depositing the channel includes vaporizing the precursor composition to form a vaporized precursor composition, and depositing the vaporized precursor composition using a physical vapor deposition technique including one or more of dc reactive sputtering, rf sputtering, magnetron sputtering, ion beam sputtering are product by process limitations and are given no patentable weight so long as the final product of said claim is the same as or obvious over the prior art. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). This particular process of vaporizing the precursor composition to form a vaporized precursor composition, and depositing the vaporized precursor composition using a physical vapor deposition technique including one or more of dc reactive sputtering, rf sputtering,

magnetron sputtering, ion beam sputtering is therefore irrelevant given that the final product of the claim is anticipated by Cillessen et al.

Regarding claim 42, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 37, wherein providing the source (3), the drain (2), and the gate (5) electrodes includes providing a substantially transparent form of the source, the drain, and the gate electrodes (Cillessen et al., Col. 4, Lines 25-36).

Regarding claim 43, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 37, but fails to disclose the providing of a liquid form of the precursor composition.

The claim to providing a liquid form of the precursor composition is a product by process limitation and is given no patentable weight so long as the final product of said claim is the same as or obvious over the prior art. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The particular process of providing a liquid form of the precursor composition is therefore irrelevant given that the final product of the claim is anticipated by Cillessen et al.

Regarding claim 44, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 43, but fails to disclose an ink-jet deposition technique for forming the channel.

The claim to an ink-jet deposition technique for forming the channel is a product by process limitation and is given no patentable weight so long as the final product of

said claim is the same as or obvious over the prior art. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The particular ink-jet deposition technique for forming the channel is therefore irrelevant given that the final product of the claim is anticipated by Cillessen et al.

Regarding claim 50, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 48, but fails to disclose the one or more compounds of the formula $A_xB_xO_x$ including an atomic composition of ratio A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xO_x$ include a ratio of A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 52, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 51, but fails to disclose the one or more compounds of the formula $A_xB_xC_xO_x$ including an atomic composition of ratio A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xO_x$ include a ratio of A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 54, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 53, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xO_x$ including an atomic composition of ratio A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xO_x$ include a ratio of A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C to D in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 56, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 55, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ including an atomic composition of ratio A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ include a ratio of A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95. The ordinary artisan would have been motivated to modify the ratio between the individual components of the compound for the purpose of modifying the electron mobility of the channel and thus modifying the switching speed of the device. The claims to a specific limitation on the value of the ratio of A to B to C to D to E in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 57, Fig. 4 of Cillessen et al. discloses the display of claim 48, but fails to specifically disclose that the metal oxide is formed in one of an amorphous form, a single-phase crystalline form, and a mixed-phase crystalline form. Cillessen does teach that the metal oxide is formed using the process of Pulsed Laser Deposition. Fig. 1 of Sakashita et al. (U.S. Patent Publication # 2004/0245561) discloses the formation (using Pulsed Laser Deposition (Paragraph 48, Lines 12-18)) of a thin film of Indium Tin Oxide 6 in an amorphous form (Paragraph 49, Lines 1-3).

***Response to Arguments***

5. Applicant's arguments with respect to claims 1, 18, 37 and 48 have been considered but are moot in view of the new ground(s) of rejection. The Applicant's replacement of the word "integer" in these three claims with the word "number" necessitated the change in the rejection from a rejection under 35 U.S.C. 103 to a rejection under 35 U.S.C. 102.

Applicant then argues that it is not known in the art to form metal oxides in an amorphous form for use as a channel, as the Examiner asserted in the Office Action of 1/10/06. In response to this argument, the Examiner has provided evidence that the formation of metal oxides in an amorphous form for use as a channel is indeed known in the art.

***Conclusion***

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William Kraig whose telephone number is 571-272-8660. The examiner can normally be reached on Mon-Fri 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

WFK
04/14/2006

EUGENE LEE
PRIMARY EXAMINER